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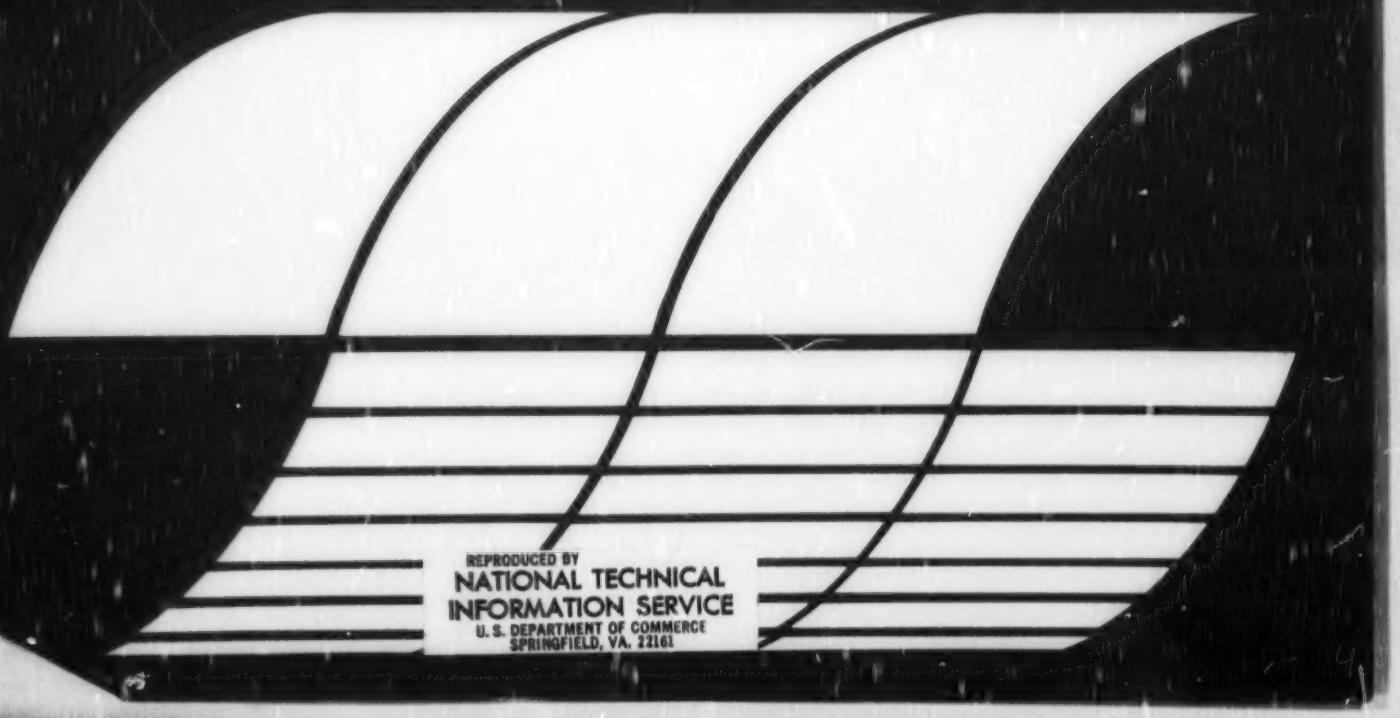
Western Energy/Environment Monitoring Study: Planning and Coordination Summary

Interagency
Energy-Environment
Research and Development
Program Report



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This report is a summary of the planning, coordination and implementation mechanisms which provide the framework for the Western Energy/Environment Monitoring Study. This Study involves participation by elements of EPA, NASA, NOAA, and USGS and is a segment of the Interagency Energy/Environment Research and Development Program Administered by EPA.

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WESTERN ENERGY/ENVIRONMENT MONITORING STUDY

PLANNING AND COORDINATION SUMMARY

DECEMBER 1976

Office of Energy, Minerals, and Industry
Office of Research and Development
U.S. Environmental Protection Agency

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ABSTRACT

The purpose of this document is to provide an overview of the Western Energy/Environment Monitoring Study. This Study is a multi-media, multi-agency research and development effort sponsored under the auspices of the Interagency Energy/Environment Program administered by the Office of Energy, Minerals, and Industry (Office of Research and Development) of the U.S. Environmental Protection Agency.

The document provides a general description of the objectives of the multi-media measurements research effort and its synthesis into a Regional Atlas of baseline media quality and its relationship to the existing and planned pattern of regional energy development.

The chief objective of the document is to provide to the Study participants an organizational outline of the planning, management and coordination of the Study as well as a listing of key personnel from all agencies (EPA, NASA, NOAA, USGS) participating in the Study. On this basis the document will foster interagency communication and expedite the achievement of the Study's research objectives.

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SECTION 1

WESTERN ENERGY/ENVIRONMENT MONITORING STUDY

In anticipation of the increasing energy requirements of the next quarter century, the Federal Government is promoting the development of untapped national energy resources. Among the major resources approaching the initial stage of development are low-sulfur coal reserves, oil shale and geothermal resources, all of which are located in abundance in the western United States.

Development in this area will involve greatly increased strip mining of coal along with the construction of large conventional power plants and coal gasification plants throughout the presently pristine plains and deserts throughout the West. The Northern Great Plains are expected to be the focus of coal mining and conversion related efforts, with this area and areas of the Southwest seeing markedly increased power plant development. Oil shale tracts in the central area of the Rocky Mountains Province are under consideration for at least limited development of synfuels demonstration plants.

It is difficult to accurately project the extent and severity of degradation of environmental quality in these areas where, to a large extent, the air is without pollutants, the land is in a pristine condition, and the quality of water, while not abundant, is vital to all life including man. Consequently, it is extremely difficult to plan the types, patterns, and magnitude of energy developments which are environmentally acceptable in these regions and to factor such energy development into national and regional environmental planning and maintenance guidelines.

In order to establish the environmental information base for such planning and guidelines, it is necessary to accurately establish present values and to track trends in media quality, pollution pathways, and the extent of adverse impact from specific sources and patterns of resource development. Furthermore, in order to accurately assess how air and water quality and land use are being and will be altered by energy development, the baseline or current values of these parameters must be measured in a consistent, comprehensive manner throughout the western region before major new developments take place. This information is basic to concrete regional air and water quality planning and to future decisions on significant deterioration, regional air quality classification, and maintenance of water quality standards keyed to energy related pollutants.

In response to this need for information, EPA's Office of Energy, Minerals, and Industry (Office of Research and Development) has planned a multi-agency study to develop integrated baseline for air quality, water quality, and land character information on a broad scale throughout the western region. Emphasis is on those areas whose environment will bear the major new burden of energy development. The objective of the study is to provide an accurate multi-media data base keyed to air and water pollutants and surface effects associated with projected western energy resource developments. This

multimedia data base will include not only energy development intensive locales, but will also focus on broad areas where long-range transport of pollutants may result in multi-jurisdictional pollution control issues. The synthesis of this baseline data into a multi-area overview of multi-media quality as related to the evolving pattern of energy development will be a key element in the environmentally protective planning of western energy development on a truly regional basis.

Cooperating with EPA in carrying out this study are elements of the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, and the National Aeronautics and Space Administration under various inter-agency agreements.

RESEARCH OPERATIONS

Air Monitoring and Data Integration

Numerous air monitoring stations in a nine state area (Montana, North and South Dakota, Wyoming, Utah, Colorado, Nevada, Arizona, and New Mexico) operated primarily by states have been identified as appropriate for use in the study. In addition, funding from OEMI has established several key air and meterological monitoring stations in the Northern Great Plains and in the oil shale areas as well as in areas of the Southwest where large power plants exist and are planned.

Broad area aircraft monitoring by the Environmental Monitoring and Support Laboratory (EMSL), Las Vegas, Nevada, is providing data which will complement ground-based data and will provide the interface with the regional air quality picture.

Special plume aerosol nucleation measurements by aircraft at the Colstrip, Montana and Farmington, New Mexico power plants, as well as meteorological modeling support are provided by NOAA to give exhaustive data at two key sites and to assist in the scaling in space and time of regional air quality scenarios. Quality assurance checks and procedures are provided by EMSL/RTP to encompass all analytical laboratories participating in the air monitoring effort.

While most sampling is done for SO_2 and particulate matter emissions from plants, a few stations are equipped for trace element and sulfate monitoring. (Some NO_2 and ozone measurements are being made in the oil shale area of Colorado, Utah, and Wyoming.) It is planned to increase the number of sites which will measure sulfate and to deploy a number of dichotomous samplers which can differentiate the level of fine particulate matter from total suspended particulates.

The coordination of the operational implementation of the study is being carried out by EMSL/Las Vegas with quality assurance support for air monitoring from EMSL/Research Triangle Park and for water monitoring from EMSL/Cincinnati. The Energy Office of EPA Region VIII in Denver is also involved in the study.

The air data is being integrated and interpreted at EMSL/Las Vegas and will be displayed in a publication such that yearly updates will provide a clear indication of significant regional air quality trends.

Water and Groundwater Monitoring and Data Integration

USGS maintains an extensive water monitoring network in the Western U. S. which this study has supplemented. Eight new surface water quality monitoring stations have been established by the U.S. Geological Survey in the oil shale areas of the Upper Colorado Basin to supplement their existing network. In addition, new stations and intensified sampling programs are taking place in the coal mining regions along tributaries of the Upper Missouri River including the Yellowstone and the Powder Rivers. Analyses are being done for numerous parameters including temperature, pH, dissolved solids, nutrients and for metals such as arsenic, beryllium, cadmium, lead, mercury, and selenium.

USGS is also performing new studies of groundwater and shallow aquifers in the oil shale regions of Colorado and Utah and at various locales associated with potential coal mining. The latter includes shallow groundwater system reconnaissance in Northwestern Colorado and in the Yellowstone and Missouri Rivers in Montana and chemical studies in Southwestern North Dakota and in Montana.

EMSL/Las Vegas is monitoring aquifers on the eastern flank of the Powder River and in the Piceance Creek Basin of Colorado where initial development of accelerated strip mining and oil shale, respectively, are projected.

Other USGS water quality studies have been initiated under the interagency program in the Black Mesa coal mining area of Arizona and in the Four Corners power plant area of New Mexico.

Overall quality assurance of these activities is provided by EMSL/Cincinnati. USGS western laboratories involved in the analyses of these measurements have entered into the energy-related quality assurance program.

EMSL/Las Vegas is synthesizing all water and groundwater quality data for the portions of the Upper Missouri and Colorado River Basins and their tributaries. The analysis will assist in determining what portions of these river systems are being most affected by energy development.

Land Use Monitoring and Information Compilation

The large geographical area to be monitored demands the application of techniques which are capable of providing synoptic environmental assessment with a relatively short time frame. Airborne remote sensing offers such a technique through the application of proven, operational procedures and the promise of increased utility with further refinement and ongoing research and development efforts.

The primary emphasis by EMSL/Las Vegas on operational remote sensing to date has been the use of instrumentation and techniques such as photography

(black and white, color, and color infrared), thermal infrared, and multispectral scanners and laser terrain profiles (through cooperation with the National Aeronautics and Space Administration (NASA) to define an environmental land use baseline for the Western United States.

Through the use of both manual, photo-interpretation, and automated data analysis, airborne acquired information may be used to determine or assess: (1) aerial extent of strip mining impact, (2) the efficacy of reclamation activities associated with disturbed land, (3) vegetation damage related to mining and energy conversion, (4) revegetation practices, (5) drainage patterns, and (6) impact on fresh water resources. The main objective of this effort is to develop operational aerial techniques capable of determining the success of extraction and processing site rehabilitation.

Initially, the program will concentrate on the development of aerial remote sensor techniques to monitor environmental factors of coal extraction and rehabilitation. Approximately half of the total effort will be to monitor these activities in the Northern Great Plains, Utah, Colorado, and Arizona. Sites of planned activity (e.g., within two to three years) and active sites will be included. Consideration of environmental impact on surface and near-surface water, soil condition and slopes, subsidence manifestation, vegetation density, and speciation and other rehabilitation aspects will be included. Fourteen coal surface mining sites were selected by EPA for ground investigation.

EPA is also responsible for providing and coordinating the ground measurements of site or activity-specific terrain parameters which, when remotely measured, will provide the basis for determining quantitative environmental impact assessment. Examples of these key parameters of features include surface contours, vegetative density, vigor and types, subsidence features, synoptic visibility, etc.

WESTERN ENERGY/ENVIRONMENT ATLAS

The totality of data obtained will be integrated into a document which will display local area energy development within the perspective of the multi-media western regional environmental quality baseline. This Atlas will be published and updated on an annual basis and will enable planners to place local energy-related environmental trends in a balanced regional context.

It is intended that user feedback from the initial document will be a key guide in the development of subsequent documents.

SECTION 2

PLANNING, MANAGEMENT, AND COORDINATION

PLANNING

The problem assessment, research objective formulation, and planning and resource allocation for the Western Energy/Environment Monitoring Study are the responsibility of the Energy Coordination Staff of the Office of Energy, Minerals, and Industry within EPA's Office of Research and Development (OEMI/ORD). The Study Project Officer and Coordinator is Dr. G. J. D'Alessio.

Specific research accomplishment plans are developed by participating elements of NASA, NOAA, and USGS, and EPA Environmental Monitoring and Support Laboratories. The plans from the respective agencies are reviewed for approval by the appropriate headquarters line managers in that agency, and allocation of funds is accomplished under interagency agreements between EPA/OEMI and NASA, NOAA, and USGS. The internal mechanism of the coordinate objective statement is used between the Office of Energy, Minerals, and Industry and the Office of Monitoring and Technical Support within EPA. Funding is allocated by OEMI upon final review and approval of each specific plan by the Deputy Assistant Administrator for Energy, Minerals, and Industry (OR&D), Dr. Stephen J. Gage, the Interagency Program Coordinator.

MANAGEMENT

The Project Officers indicated for each specific research accomplishment plan are responsible for the implementation and completion of the project and achievement of the milestones described in that plan.

Interface and coordination requirements between individual projects are explicit in the original objective statements. As a segment of the Interagency Energy/Environment Research and Development Program administered by OEMI, formal lines of communication exist between EPA/OEMI headquarters (planning) and the headquarters (implementation and management) units of NASA, NOAA, and USGS which have responsibility for their respective field units. These formal lines are used to ensure clear understanding of research objectives and milestones at all levels and to rapidly alleviate any difficulties which may arise in the course of the project. Any reorientation in project emphasis from year to year is transmitted in this fashion (see Table 1).

COORDINATION

In addition to the above arrangement, it was judged essential to provide for a continual flow of technical information between the appropriate field units of EPA and the field units of NASA, NOAA, and USGS.

Within EPA certain individuals have been designated as the EPA Field Coordinators for specific projects implemented by NASA, NOAA, and USGS (see Table 2). Likewise, similar channels have been established among EPA field units (see Table 3).

Figure 1 indicates the flow of (a) research objectives from the planning office to the project directors, (b) projects which are in direct support of other research project activities, (c) the flow of scientific information into overall information integration efforts, and (d) the final general output of the Western Energy/Environment Study, in addition to which each project develops specific reports. The Study Coordinator and EPA Field Coordinators are available as necessary for clarification of research objectives and operational guidance. Quarterly or semi-annual reports are produced by the project directors and are sent to the Study Coordinator. Annual reviews of each project take place in advance of the next year's resource planning.

OUTPUT

Each project produces semi-annual status reports and an annual technical report. In addition to this, the Environmental Monitoring and Support Laboratory in Las Vegas is responsible for seeing that all baseline data is interpreted and entered in EPA's data systems (SAROAD for air data and STORET for water data).

The data from the various projects is interpreted and synthesized into energy-related land use maps which correlated air and water pollution baseline data with the emerging patterns of new source development.

TABLE 1. WESTERN ENERGY/ENVIRONMENT MONITORING STUDY
INTERAGENCY ENERGY/ENVIRONMENT PROGRAM

WESTERN ENERGY/ENVIRONMENT MONITORING STUDY	INTERAGENCY ENERGY/ENVIRONMENT PROGRAM
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HUTTON, R. NOAA Rockville, Maryland 20852	STONEY, W.E. NASA Earth Observation Program Washington, D.C. 20036

TABLE 2. WESTERN ENERGY/ENVIRONMENT MONITORING STUDY
INTERAGENCY COORDINATION

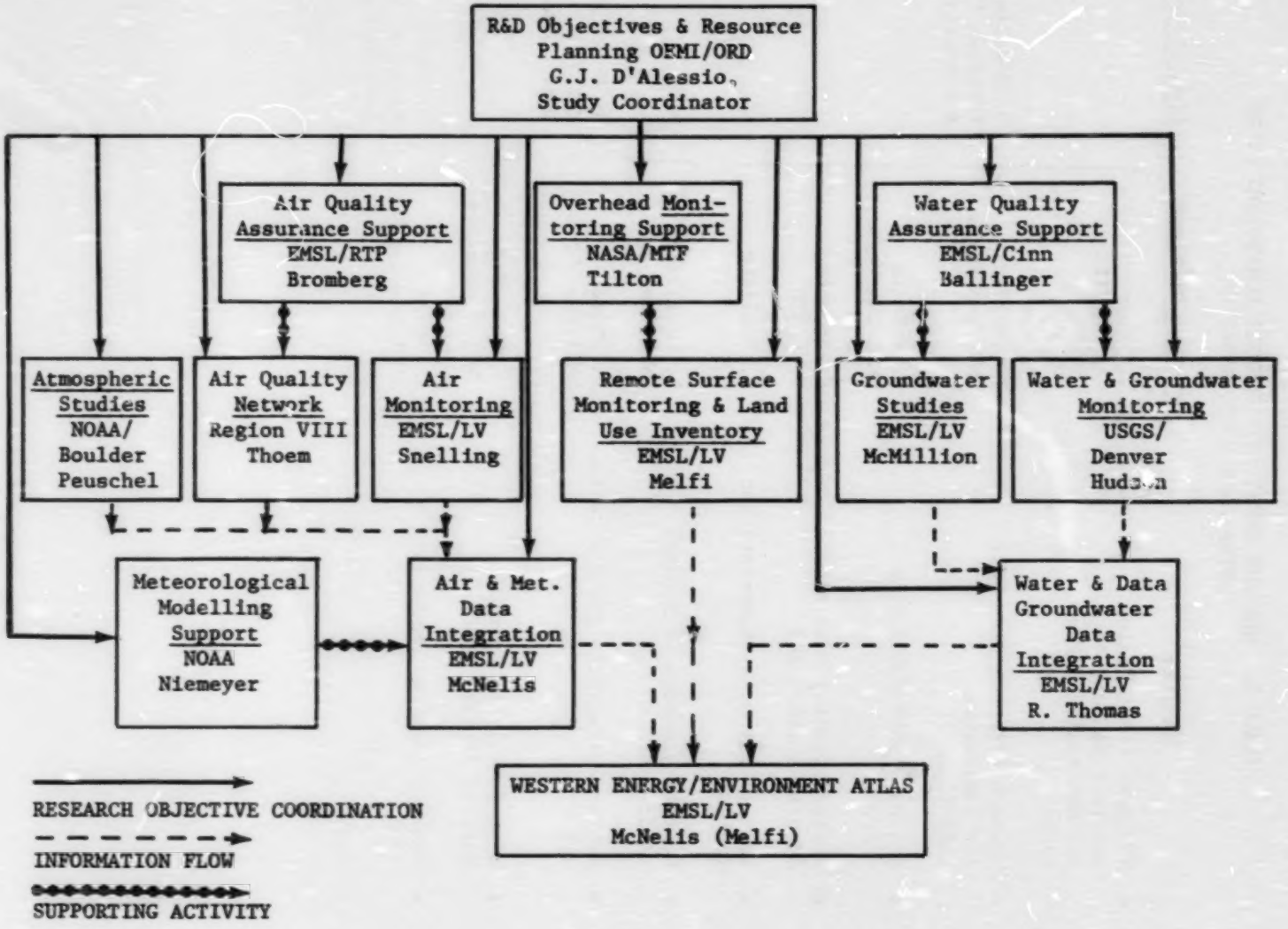
Agency	Project	Project Director	EPA Field Coordinator
NASA	• Western Energy Resource Overhead Monitoring (WEROM) (BEL)	L. Tilton (NASA) ERL/MTF	H. Melfi EMSL/Las Vegas Land Use Study
USGS	• Western Water and Groundwater Baseline Monitoring (BBW, BBY, BBZ)	H. Hudson (USGS) Denver, Colorado	D. McNelis[1,2,3] EMSL/Las Vegas Water Quality Study
NOAA	• Western Meteorological Modelling Support (BEK)	L. Niemeyer (NOAA) ESRL/RTP	D. McNelis EMSL/Las Vegas Air Quality Study
	• Western Atmospheric Studies (BEC)	R. Pueschel (NOAA) Boulder, Colorado	

1. Long Term Baseline Data Coordination and Interpretation (Water)
2. Station Identification (Water) (T. Thoem, EPA Region VIII, Denver)
3. Quality Assurance Support (Water) (D. Ballinger, EPA/EMSL/Cincinnati)

TABLE 3. WESTERN ENERGY/ENVIRONMENT MONITORING STUDY
INTRA-AGENCY COORDINATION

Project	Project Director	Field Coordinator
• Northern Great Plains and Central Rockies Air Monitoring Network (AED)	T. Thoem Region VIII	
• Western Airborne Wide Scale Air Monitoring (ABF-1)	R. Snelling EMSL/Las Vegas	D. McNelis EMSL/Las Vegas Air Quality STudy
• Southwest Air Monitoring (ABF-2)	D. McNelis EMSL/Las Vegas	
• Western Quality Assurance Support (Air) (ABP)	S. Bromberg EMSL/RTP	
• Western Air Data Interpretation (ABF-3)	R. Snelling	
• Western Groundwater Studies (ABH)	L. McMillion EMSL/Las Vegas	
• Western Water Data Interpretation (AEG)	R. Thomas EMSL/Las Vegas	D. McNelis EMSL/Las Vegas Water Quality Study
• Western Quality Assurance Support (Water) (ABQ)	D. Ballinger EMSL/Cincinnati	
• Western Land Use Monitoring (ABI)	H. Melfi EMSL/Las Vegas	H. Melfi EMSL/Las Vegas Land Use Study

FIGURE 1. U.S. ENVIRONMENTAL PROTECTION AGENCY WESTERN ENERGY/ENVIRONMENT MONITORING STUDY
OFFICE OF ENERGY, MINERALS, AND INDUSTRY (ORD) COORDINATION AND MANAGEMENT


R&D Objectives & Resource Planning OEMI/ORD G.J. D'Alessio, Study Coordinator
Air Quality Assurance Support EMSL/RTP Bromberg
Overhead Monitoring Support NASA/MTF Tilton
Water Quality Assurance Support EMSL/Cinn Ballinger
Atmospheric Studies NOAA/ Boulder Peuschel
Air Quality Network Region VIII Thoem
Air Monitoring EMSL/LV Snelling
Remote Surface Monitoring & Land Use Inventory EMSL/LV Melfi
Groundwater Studies EMSL/LV McMillion
Water & Groundwater Monitoring USGS/ Denver Hudson
Meteorological Modelling Support NOAA Niemeyer
Air & Met. Data Integration EMSL/LV McNelis
Water & Data Groundwater Data Integration EMSL/LV R. Thomas
WESTERN ENERGY/ENVIRONMENT ATLAS EMSL/LV McNelis (Melfi)
RESEARCH OBJECTIVE COORDINATION
INFORMATION FLOW
SUPPORTING ACTIVITY

WESTERN ENERGY/ENVIRONMENT MONITORING STUDY

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APPENDIX

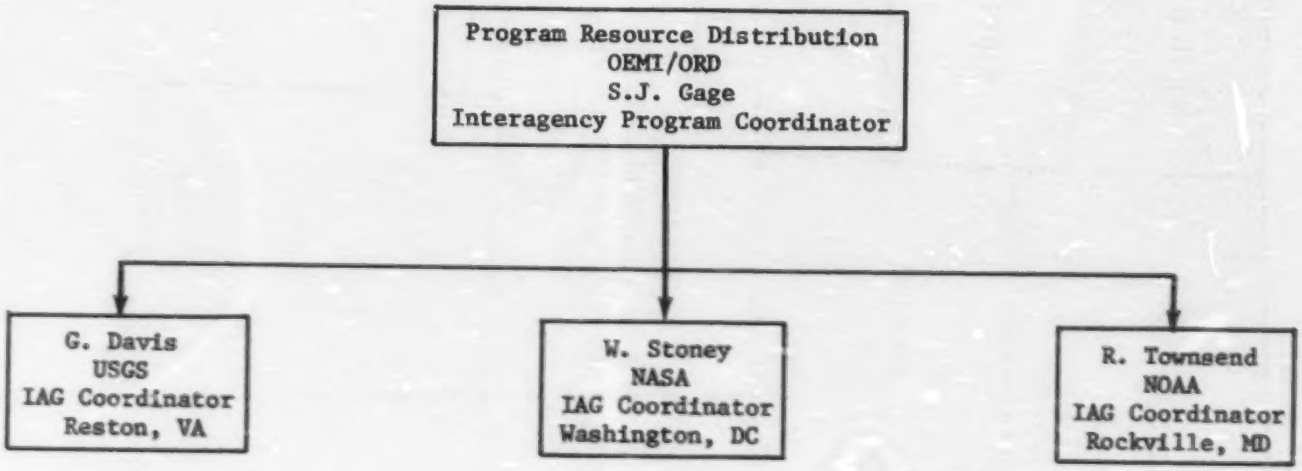

Figure 2. U.S. Environmental Protection Agency
Western Energy Environment Monitoring Study
Office of Energy, Minerals, and Industry (ORD)
Resource Flow Format

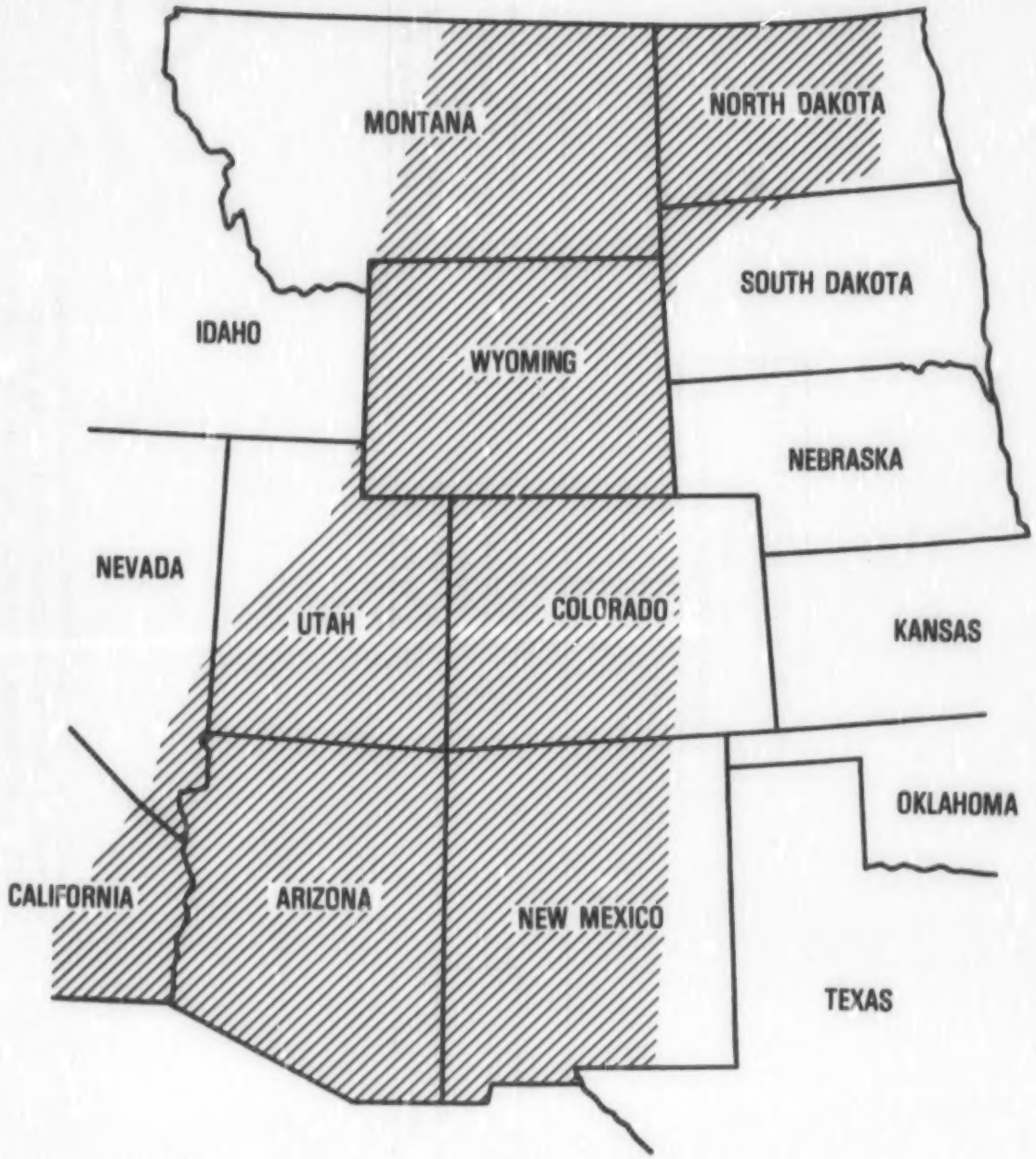

Figure 3. Western States Energy Study Area

TABLE 4. WESTERN ENERGY/ENVIRONMENT MONITORING STUDY
R AND D OBJECTIVE PLANS

WESTERN ENERGY/ENVIRONMENT MONITORING STUDY

Plan	Research Objective	Responsible Agency	Project Director
ABF	Western Regional Baseline Air Monitoring Data Analysis	EPA/EMSL/Las Vegas	D. McNelis
AED	Northern Great Plains Energy/ Air Quality Baseline	EPA/Region VIII Denver	T. Thoem
ABP	Western Air Monitoring Quality Assurance Support	EPA/EMSL/RTP	S. Bromberg
BEC	Atmosphere and Meteorological Studies of Pollutants from Energy Production in the Western United States	NOAA	R. Pueschel
BEK	Meteorological Interpretation and Prediction of Air Quality in the Western United States Related to Energy Activities	NOAA	L. Niemeyer
AEG	Western Region Water Monitoring and Data Analysis	EPA/EMSL/Las Vegas	D. McNelis
BBZ	Energy Related Surface Water Monitoring/Western Region Baseline	USGS	H. Hudson
BBY	Energy Related Groundwater Monitoring/Western Region Baseline	USGS	H. Hudson
BBW	Energy Related Surface and Groundwater Monitoring Studies/Western Region	USGS	H. Hudson
ABQ	Western Water Monitoring Quality Assurance Support	EPA/EMSL/Cincinnati	D. Ballinger
ABH	Western Groundwater Monitoring Methods Development	EPA/EMSL/Las Vegas	L. McMillion
ABI	Western Overhead Surface Monitoring and Techniques Development	EPA/EMSL/Las Vegas	H. Melfi

TABLE 4. WESTERN ENERGY/ENVIRONMENT MONITORING STUDY
R AND D OBJECTIVE PLANS (Continued)

WESTERN ENERGY/ENVIRONMENT MONITORING STUDY

Plan	Research Objective	Responsible Agency	Project Director
BEL	Technical Support for Western Energy Related Environmental Assessment/ Overhead Monitoring Method Development	NASA	E. Tilton